

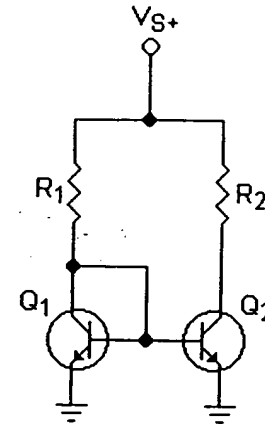
Exhibit A

# Current mirror

From Wikipedia, the free encyclopedia.

A **current mirror** is a circuit designed to regulate a current; to keep it constant regardless of loading.

Transistor  $Q_1$  is connected such that it has a constant current flowing through it; it actually behaves like a forward-biased diode, and the current is determined by the resistance  $R_1$ . It is important to have  $Q_1$  in the circuit, instead of a regular diode, because the two transistors will be matched, and thus the two branches of the circuit will have similar characteristics. The voltage at the base of  $Q_1$  will necessarily be the exact voltage that sustains the collector current. The second transistor,  $Q_2$ , which then has the same base voltage, changes its own resistance so that the total resistance in the second branch of the circuit is the same as the total resistance in the first branch, regardless of the load resistor,  $R_2$ . Since the total resistance in each branch is the same, and they are connected to the same supply,  $V_{S+}$ , the amount of current in each branch is the same.



The value of  $R_1$  can be varied to change the amount of current going through  $R_2$ . Since  $R_2$  can change dynamically, and the current through it will stay the same, the current mirror is not only a current regulator, but also can be thought of as a constant current source, which is the way it is used in integrated circuits.

More matched transistors can be connected to the same base and will supply the same current. In other words, the right half of the circuit can be duplicated several times with several different loads on each.

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Categories: Electronic circuits

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